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methods yet issued. The subject is presented in a careful, well-balanced, well-digested form, not encumbered with unnecessary diffuseness and not marred by too great attention to pathological and omission of non-pathological details. Investigations in bacteriology, in order to carry weight, must be conducted with a full appreciation of the absolute need of refined manipulation, and their completeness depends upon a knowledge of the numerous ways in which they may be conducted and of the ends to be attained by each process. This work admirably meets the requirements of a safe and practical guide to both the student and the specialist.

Some of the topics treated are the principles of sterilization, direct examination of bacteria, uses and methods of staining, pure cultures, cultivation in fluids, fractional and dilution methods, opaque and transparent solid cultures, slide, plate and test-tube cultures, determination of the causal relation of bacteria to decomposition and disease, septic and parasitic bacteria, the effects of temperature, pressure, gases, and electricity upon bacteria, how to study the bacteria in earth, air and water. Many other topics are also considered, but an enumeration of all of them would still fail to give a just idea of the book's real value, which lies to a considerable extent in the admirable manner in which each topic is treated.

Some fault might be found with the translation, but as the defects do not affect the truthfulness of the work, so far as noticed, they may well be left to the captious. The American publishers have done their part of the work well, although the matter has been spread over one-fourth more space than in the German edition. The two fine colored plates are omitted, but a useful index is added.

The German work was published in February, 1885. It ran through two editions, and in November, 1885, a third much improved and augmented edition was prepared, but was not received in time for the translator to make use of it. This third edition adds seventy pages of new matter and nine new woodcuts. The additions are scattered throughout the work, upon nearly every page, the most considerable being descriptions of Fol's sterilizing kettle, Chamberland's porcelain filter, apparatus for sterilizing and cultivating at constant temperatures below 75° C., other forms of culture vessels and inoculating instruments, additional nutrient solutions, and the principles of staining. The four pages of the original work upon the classification of the bacteria have been nearly tripled and entirely rewritten. The colored plates illustrate slide, plate and test-tube cultures, cultures on opaque solid media, and staining for several purposes.

Bacteriological studies in America can not fail to receive a decided impulse from the advent of this admirable work, and we shall not be surprised to find that new editions are demanded often enough to keep pace with the growth of technic.

NOTES AND NEWS.

THE *Western Druggist*, published in Chicago, has a good botanical department, edited by Prof. E. S. Bastin.

AN INTERESTING article on Pezizæ by J. B. Ellis is given in the April number of the *Journal of Mycology.*

DR. GOODALE is giving a course of semi-weekly lectures before the Woman's Education Association of Boston.

IN THE JUST established Buffalo College of Pharmacy, Dr. D. S. Kellicott has been appointed professor of botany and microscopy.

A WORK on the forms of bacteria and their relation to genera and species has been published by Dr. Hueppe, and is reviewed in this number.

THE APRIL number of the *Journal of Microscopy and Natural Science* contains a sketch of Charles Darwin, being an address by H. W. S. Worsley-Benison, F. L. S.

DR. VASEY in the *Bulletin of the Torrey Botanical Club* records finding tubers on Hydrocotyle Americana. They were oblong, and from a quarter to half an inch long.

DR. J. H. OYSTER, of Paola, Kansas, has just lost by fire all the copies of his "Catalogue of the Plants of America." Next winter he proposes to publish a new edition.

GARTENFLORA, of March 15, contains a notice of Dr. Gray's seventy-fifth birthday, and also an outline of his life, taken from the biographical sketch in the January GAZETTE.

AN EXPLANATION of the mechanical causes of the various methods of æstivation is attempted by K. Schumann in *Berichte* der deutschen botanischen Gesellschaft, iv. 53–68.

AUG. SCHULZ records a case (Ber. d. deut. bot. Gesell. iv. 52) in which the outer walls of certain epidermal cells of Salicornia herbacea were found to separate entirely from the side walls.

FROM THE report of the Montreal Botanic Garden we learn that there are 197 known botanic gardens. Germany has 34, Italy 23, France 20, Great Britain and Ireland 12, West Indies 6, United States 5.

PROF. J. L. BUDD, of the Iowa Agricultural College, has issued a bulletin of 64 pages, containing revised lists of fruits, trees and shrubs from N. E. Europe, that have been on trial on the college grounds.

THE READERS of the GAZETTE will be interested in the complimentary dedication of a new genus of grasses to the well known American agrostologist, by Prof. Hackel of Austria, especially as its first publication is made through an American journal.

THE JOURNAL of the New York Microscopical Society has reached the end of its first year. The editor, Mr. Braman, who has managed its publication with marked success, finds it necessary to resign. The journal is deserving of ample support.

WE WOULD CALL attention again to the sections of the leaves of Abietineæ, to be obtained of Rev. J. D. King, of Fall River, Mass. They are admirably mounted and stained and are well calculated for a critical study of these peculiar leaf structures.

PINUS ENGELMANNI has turned up again. Forty years ago Wislizenus collected in the mountains of Mexico a single specimen, which is now in the Berlin herbarium. Good specimens of leaves and cones have lately been received at the Gray herbarium.

THE ALGA, Pithophora Kewensis, first found in a lily tank at the Kew Gardens and supposed to be tropical, has been found by Mr. Wolle, Mr. Balen and others in several localities in eastern United States, according to the *Journal of the N. Y. Microscopical Society*.

SOME MARKED DIFFERENCES in the structural character of the flowers of different varieties of the apple are illustrated and described by Dr. W. J. Beal in the February number of the *American Naturalist*. It is suggested that such characters might well be used in horticultural descriptions of varieties.

MR. JOHN MACOUN of the Survey of Canada is on a visit to Europe. Before leaving this country he completed the writing of Part III of the Catalogue of Canadian Plants, which carries it through the Coniferæ. This part will also include an addendum bringing the whole work up to date, and a complete index.

A LARGE COLLECTION of Scandinavian mosses belonging to the late J. E. Zetterstedt is for sale, either in sets or by single specimens. The first series of 209 specimens is offered for seven dollars, or specimens may be selected for less than five cents each. The specimens and labels are in envelopes unmounted. Address, Dr. H. Wilh. Arnell, Jönköping, Sweden, using either English, French or German.

THE BACTERIOLOGICAL EXAMINATION of drinking water is attracting much attention, and the remarks of Dr. Theobald Smith before the Biological Society of Washington, printed in the *Amer. Microscopical Journal* for April, are timely. Before unskilled investigators publish results they should carefully peruse this article, and not unwittingly bring such work into disfavor by overlooking the simple fact that the germs of water are largely innocuous, and that the detection of disease germs in drinking water is at present extremely difficult.

Dr. Julius Röll, of Darmstadt, is publishing in *Flora* an extended paper, "Zur Systematik der Torfmoose." The Sphagna present a well worked but always tempting field for study, especially tempting to German systematists, as they exhibit almost interminable variations and give abundant opportunity for the description (if not discrimination) of innumerable varieties, forms and subforms.

In the *Bulletin of the Torrey Botanical Club*, for April, Mr. Douglas H. Campbell describes (with plate) the development of the antheridium in ferns, the observations being principally upon Asplenium filix-fœmina, Onoclea Struthiopteris, and O. sensibilis. In the same issue Dr. George Vasey proposes eight new species of Gramineæ and two new varieties, six of which belong to the genus Agrostis.

The size of the bordered pits of coniferous wood is found by Rev. J. L. Zabriskie* to be quite constant in the same species, but to have up to a hundred per cent. variation among different species. The largest examined are those of the sugar pine (Pinus Lambertiana) and the smallest of the canoe cedar (Thuja gigantea). The former are about $\frac{1}{1000}$, and the latter about $\frac{1}{2000}$ of an inch in diameter.

We do a good service to all teachers and students of botany by calling their attention to the announcement of the summer course at the Botanic Garden of Harvard University. The course as planned is an admirable one, and all who have heard Dr. Goodale lecture know how attractive morphology and physiology become in the hands of a master. Mr. Sargent lectures on cryptogams, and directs the laboratory work.

The botanical department of the University of Nebraska has been receiving some excellent additions in the way of books and exsiccatæ, as we learn from the students' journal, *Hesperian*. Among the books are full sets of the Annales des Sciences Naturelles, Pringsheim's Jahrbücher für wiss. Botanik, Boott's Illustrations of Carex, and Bentham's Flora Australiensis. The exsiccatæ include some 14,759 species belonging to over twenty different publications.

Winter storms often result in an enormous destruction of buds. Last winter, at Cambridge, Mass., during a wind storm of almost unprecedented severity and of five days duration, the snow was thickly covered with buds switched off the elm trees by the thrashing branches. These fallen buds collected under the lee of walls and walks in piles. The number lost from each good-sized tree must have been in the thousands, yet the trees seem in no wise the worse as they unfold their leaves this spring.

In the *Journal of Botany*, for April, Mr. J. G. Baker has begun a synopsis of the Rhizocarpeæ. In this first part the genera Salvinia and Azolla are included, the former with thirteen species, the latter with five. No species of Salvinia is recorded from North America but there are five in South America, six in Africa, of which three are peculiar to Madagascar, one in Asia, and one (S. natans) common to Europe and Asia. The five species of Azolla are tropical, but one (A. Caroliniana) extends into the United States.

A botanical club has been organized in Utica, N. Y., and bears the name "Asa Gray Botanical Club." The name is peculiarly appropriate, both from the position of the botanist whose name it commemorates, and also because the club is situated in his native county. It numbers 24 members at present and has an organization like that of the Torrey Botanical Club, and from the spirit shown we prophesy for it a successful future. Its officers are Dr. J. V. Haberer, President; Miss Phelps, Vice President: Prof. George C. Hodges, Secretary; Rev. Wm. B. Coleman, Treasurer; Mr. W. P. Shepherd, Curator.

Dr. W. G. Farlow gives some notes on certain vegetable parasites offish in the *Bulletin of the U. S. Fish Commission* for February 8. One of these is Clathrocystis roseo-persicina of Cohn which causes the reddening of codfish and which has been identified with that on red fish in France, and presumably the same as said to have caused sickness of soldiers in Algiers who ate red fish. Sarcina morrhuæ of Farlow has been found associated with it upon our coasts, and has recently been identified with S. litoralis found by Poulsen on mud in Denmark. The latter name has precedence. The third species is Oidium morrhuæ of Farlow.

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*Jour. N. Y. Micr. Soc., I, p. 218.

AN ACCOUNT of some highly interesting experiments "On the transpiration-stream in cut branches," by Francis Darwin and R. W. Phillips, is given in Proc. Camb. Phil. Soc. v. 330–367 (1886). These experiments were undertaken to help decide between the two theories as to the place of the stream of water which supplies the loss by transpiration, viz: whether the chief and essential path of this stream is in the *walls* of the wood-elements or in their *cavities*. The results favor strongly the latter view. The apparatus used by them for measuring transpiration is so simple and with proper precautions so accurate that a description of it will be useful to teachers of physiology. It consists of a large T-tube placed in this position ⊢. The now horizontal limb is bent up so as to be parallel to the vertical one. The upper end of this bent limb is to receive the branch to be experimented on. The upper end of the straight limb is closed with a rubber cork, while from the lower descends, through a rubber stopper, a capillary (thermometer) tube 30–40 cm. long. The whole apparatus is now filled with water and the experimental branch attached by means of a short piece of rubber tubing. The severing of the branch and attaching it to the T-tube must be done under water as in all such experiments. The apparatus is now to be supported in an upright position with the capillary tube dipping into a cup of water supported on a low block. After a few minutes remove the cup and allow a bubble of air to enter the lower end of the capillary tube. This index bubble must be of equal length in all experiments and must be allowed to travel to a mark 10 cm. up the tube before readings commence. These readings consist of the rate at which the bubble traverses from this point a fixed length of tube, say to its upper end. The time of travel must be recorded by a stop-watch or other device for measuring accurately fractions of seconds. The reciprocals of these times give a series of figures proportional to the amount of water absorbed by the branch in a given time. Particular care must be taken to prevent leakage at joints and stoppers.

M. LÉO ERRERA'S results (Berichte d. deut. bot. Gesell, iv. 16–18 [1886]) from a study of the transpiration-stream also militate against the imbibition theory. His experiment is simple and adapted to the lecture table. An injection mass is prepared, consisting of gelatine 20 parts, water 100 parts, to which is added enough Chinese ink, well-rubbed up, to render the mass black. This mass melts at 33° C. and solidifies at 28°. Leafy twigs of any plant with large vessels (Errera used Vitis vulpina) are to be severed from the plant, one in the air, another under water, and a third under the just-melted gelatine mass. The latter is then to be quickly plunged into cold water, and a fresh surface made by removing a thin slice from the previous cut. Thus the vessels are closed (as can readily be seen) with the black gelatine, but the walls of the wood-elements are exposed to the water. All having been placed in water, the injected twig soon wilts and can be shown, by measuring the water, to absorb vastly less (not $\frac{1}{30}$ in the experiment with Vitis) than even the twig cut in air. The wilted twig can, however, be revived, if within half an hour the gelatine-filled portion be cut off.

A CAREFUL and sympathetic sketch of the life of John Williamson, botanist and artist, written by R. M. Kelley, and illustrated with a portrait, several decorative designs, and a half-dozen photographic reproductions of his etchings, is given in the *Southern Bivouac* for March. The writer had good opportunity to learn the story of his life, and presents it in very full and interesting detail. Williamson was noble-minded, ambitious, and undaunted. In spite of most unpropitious circumstances he achieved a lasting reputation, especially through his ferns etchings. These are unexcelled, having received the commendation of no less an authority than Philip Gilbert Hamerton for their artistic excellence, and of many botanists for their scientific accuracy.

THE APPROPRIATION BILL for the Department of Agriculture for the year 1886–7, which has been recommended to Congress by the House committee on agriculture contains a number of items which should interest botanists. One will naturally look first for the Botanical Division, and will doubtless be surprised to find there is none recognized. There is, however, a Microscopical Division, for which an appropriation of $4,000 is asked; but this is evidently not botanical, as the money is to be expended for chemicals, fibers, investigations into adulteration of food, and for salaries. The experimental gardens and grounds, which ought to be of real value to the botanical and economic interests of the country, are allotted $24,450, besides which there is $2,000 for the introduction of foreign medicinal plants. The Seed Division—all know what that is—asks for $108,240; forestry is allotted $10,000; for the purchase of entomological, botanical, chemical, mineralogical, agricultural and other works and periodicals for the library $1,500; for collecting and preparing material for museum and herbarium $1,000. This covers all appropriations in any way affecting botany, except the salaries of the botanist and assistant botanist.